

I (We) claim:

1. An apparatus for controlling an automatic transmission comprising:

a vehicle drive system in which a gear type transmission and a friction clutch are connected in series;

a gear changing device for changing said gear type transmission;

a clutch drive device for disengaging and engaging said friction clutch;

an operating condition detecting device for detecting an operating condition of an engine; and

a control unit for inputting detected signals from said operating condition detecting device, and outputting control signals to said gear changing device and said clutch drive device based on the detected signals,

wherein said control unit determines whether a stop intention condition of a driver is satisfied or not, and performs

first gear change control for, if said stop intention condition is determined to be satisfied, disengaging said friction clutch and changing said gear type transmission to a neutral position, and

second gear change control for, when an accelerator opening becomes greater than or equal to a predetermined value, after said friction clutch is disengaged and said gear type transmission is changed to the neutral position by said first gear change control,

changing said gear type transmission to a gear according to a vehicle speed, and engaging said friction clutch.

2. The apparatus for controlling an automatic transmission according to claim 1, wherein said second gear change control, when the vehicle speed is less than a first predetermined value, engages said friction clutch gradually via a half clutch state.

3. The apparatus for controlling an automatic transmission according to claim 2, wherein said control unit, after said friction clutch is disengaged and said gear type transmission is changed to the neutral position by said first gear change control, if the vehicle speed is less than a second predetermined value, which is less than said first predetermined value, performs a third gear change control to change said gear type transmission to a departure gear.

4. The apparatus for controlling an automatic transmission according to claim 1, wherein said control unit, after said friction clutch is disengaged and said gear type transmission is changed to the neutral position by said first gear change control, if an accelerator opening amount is less than said predetermined value, and vehicle speed is less than a third predetermined value, performs a fourth gear change control to engage said friction clutch.

5. The apparatus for controlling an automatic transmission according to claim 4, wherein said fourth gear change control, after said friction clutch is disengaged and said gear type transmission is changed to the neutral position by said first gear change control, when a state in which said accelerator opening amount is less than said predetermined value is maintained for a predetermined time, engages said friction clutch.

6. The apparatus for controlling an automatic transmission according to claim 1, wherein said stop intention determination determines that stop intention conditions are satisfied when said gear type transmission is changed to a drive gear, a brake is operated, and an engine rotational speed is less than a predetermined value, or a vehicle speed is less than a fourth predetermined value.

7. An apparatus for controlling an automatic transmission comprising:

a vehicle drive system in which a gear type transmission and a friction clutch are connected in series;

a gear changing device configured to change said gear type transmission;

a clutch drive device configured to disengage and engage said friction clutch;

an operating condition detecting device configured to detect an operating condition of an engine; and

a control unit configured to input detected signals from said operating condition detecting device, and output control signals to said gear changing device and said clutch drive device based on the detected signals, wherein

said control unit comprises:

means for determining whether a stop intention condition of a driver is satisfied or not;

first gear change control means for, if said stop intention condition is determined to be satisfied, disengaging said friction clutch and changing said gear type transmission to the neutral position; and

second gear change control means for, when an accelerator opening amount becomes greater than or equal to a predetermined value, after said friction clutch is disengaged and said gear type transmission is changed to the neutral position by said first gear change control means, changing said gear type transmission to a gear according to a vehicle speed, and engaging said friction clutch.

8. An apparatus for controlling an automatic transmission comprising:

a gear change stage detecting device configured to detect a gear change stage of a gear type transmission;

a gear changing device configured to change the gear of said gear type transmission;

an operating condition detecting device configured to detect an operating condition of an engine; and

a control unit configured to input detected signals from said operating condition detecting device, and output control signals to said gear changing device based on the detected signals, wherein said control unit

determines whether a driver has an intention to decelerate or not based on a value detected by said operating condition detecting device, and

determines whether the engine is in an idle-up state or not based on an engine torque detected by said operating condition detecting device, and

performs gear change control to change the gear of said gear type transmission to a neutral position when determined that a gear change stage detected by said gear change stage detecting device is a drive gear, and that there is an intention to decelerate by said deceleration intention determination, and determined that said vehicle speed detected by said operating condition detecting device is less than a first predetermined value and that it is in an idle-up state by said idle-up determination.

9. The apparatus for controlling an automatic transmission according to claim 8, wherein said deceleration intention determination, determines that the driver has an intention to decelerate when it is determined, based on the detected value of said operating condition detecting device that a brake is operated, or an accelerator opening amount is less than a second predetermined value.

10. The apparatus for controlling an automatic transmission according to claim 8, wherein said idle-up determination, determines that the engine is in an idle-up state when it is determined that the amount of fuel supplied to the engine, which is approximately proportional to the engine torque is greater than or equal to a third predetermined value, based on a detection value of said operating condition detecting device.

11. An apparatus for controlling an automatic transmission comprising:

gear change stage detecting device configured to detect a gear change stage of a gear type transmission;

gear changing device configured to change the gear of said gear type transmission;

operating condition detecting device configured to detect an operating condition of an engine; and

a control unit configured to input detected signals from said operating condition detecting device, and output control signals to said gear changing device based on the detected signals, wherein said control unit comprises:

means for determining whether a driver has an intention to decelerate or not based on a value detected by said operating condition detecting device,

means for determining whether the engine is in an idle-up state or not based on an engine torque detected by said operating condition detecting device, and

gear change control means for changing the gear of said gear type transmission to a neutral position when determined that a gear change stage detected by said gear change stage detecting device is a drive gear, and that there is an intention to decelerate by said deceleration intention determination means, and determined that said vehicle speed detected by said operating condition detecting device is less than a first predetermined value and that it is in an idle-up state by said idle-up determination.

12. A gear change control apparatus of a multi-stage transmission wherein a sub transmission is connected to a main transmission on its output side, comprising:

a gearshift device configured to change said multi-stage transmission;

a main transmission changing unit configured to change said main transmission;

a sub transmission changing unit configured to change said sub transmission;

an operating condition detecting device configured to detect an operating condition of an engine; and

a control unit configured to input detected signals from said operating condition detecting device, and output control signals to said main transmission changing unit and said sub transmission changing unit based on said detected signals, wherein

said control unit:

determines whether a vehicle is stopped or not based on the detected value of said operating condition detecting device;

determines whether a gear change operation to change said sub transmission to a drive gear is performed by said gearshift device or not;

and when it is determined that the vehicle is stopped, and it is determined that said gear change operation is performed, starts changing of said sub transmission changing unit, and

afterwards, when the changing of said sub transmission is completed, or when the changing of said sub transmission is not completed even though a predetermined time has elapsed since changing started, starts the changing of said main transmission by said main transmission changing unit.

13. The gear change control apparatus of a multi-stage transmission according to claim 12, wherein said vehicle stop determination determines whether the vehicle is stopped or not based on a vehicle speed detected by said operating condition detecting device.

14. The gear change control apparatus of a multi-stage transmission according to claim 13, wherein;

 a clutch is connected to an input side of said main transmission, and there is provided

 a change state detecting device configured to detect a change state of said main transmission, and

 an driving condition detecting device configured to detect an operating condition of said clutch, and

 said gear change operation determination, when it is detected that said main transmission is in the neutral position by said change state detecting device, and it is detected that said clutch is disengaged by said driving condition detecting device, determines whether or not a gear change operation to change said sub transmission to a drive gear is performed.

15. A gear change control apparatus of a multi-stage transmission in which a sub transmission is connected to a main transmission on its output side, comprising:

gearshift means for changing said multi-stage transmission;
main transmission changing means for changing said main
transmission;

sub transmission changing means for changing said sub
transmission;

operating condition detecting means for detecting an operating
condition of an engine; and

a control unit for inputting detected signals from said operating
condition detecting means, and outputting control signals to said main
transmission changing means and said sub transmission changing means
based on said detected signals, wherein

said control unit comprises:

means for determining whether a vehicle is stopped or not based
on the detected value of said operating condition detecting means;

means for determining whether a gear change operation to change
said sub transmission to a drive gear is performed by said gearshift
means or not, and for starting changing of said sub transmission
changing when it is determined that the vehicle is stopped, and it is
determined that said gear change operation is performed; and

means for starting changing of said main transmission by said
main transmission changing means afterwards, when the changing of said
sub transmission is completed, or when the changing of said sub
transmission is not completed even though a predetermined time has
elapsed since changing started.